

REMARKS

The Office Action mailed December 16, 2002, has been reviewed and the comments of the Patent and Trademark Office have been considered. New claims 50-54 have been added. Support for these new claims can be found at least in original claims 20, 21 and 23. No new matter has been added. Claims 19-54 are pending for consideration.

Allowable subject matter

The Office Action indicated that claims 20-36, 39, 41, 43 and 47 contained allowable subject matter. Applicants have not amended these claims at this time, however, because, for the reasons discussed below, applicants believe that independent claims 19 and 42, from which these claims depend, are allowable.

Rejections under 35 U.S.C. § 102

Claims 19, 37-38, 40, 42, 44-46 and 48-49 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 5,494,008 to Ohkawa et al. (hereafter "Ohkawa"). Applicants respectfully traverse this rejection for the following reasons.

Independent claim 19 is directed to a method, and includes the step of calculating an estimated internal EGR quantity of an engine in accordance with three parameters, (1) the exhaust valve closing timing, (2) the intake valve opening time and (3) the engine speed. The present inventors have realized that in order to achieve responsive control of the valve actuators of an engine, an accurate determination of an internal EGR quantity is required (see present specification, page 2, lines 24-27). In this regard, according to the present invention as recited in claim 19, an estimated internal EGR quantity is calculated. Ohkawa, in contrast, does not disclose calculating an estimate of an internal EGR quantity, much less calculating an estimate of an internal EGR quantity in the specific fashion recited in claim 19.

Ohkawa discloses an engine valve timing control apparatus for continuously varying the valve timing of an intake valve. By varying the intake valve timing, the valve timing

control apparatus varies the valve overlap of the intake and exhaust valves, and thus adjusts the amount of the internal EGR (see abstract). Ohkawa, while disclosing that the amount of internal EGR is adjusted based on varying the overlap of intake and exhaust valves, fails to disclose calculating an estimate of an internal EGR quantity, much less calculating the estimate in the specific fashion recited in claim 19. More specifically, Ohkawa fails to disclose calculating an estimated internal EGR quantity in accordance with the exhaust valve closing timing, the intake valve opening timing and the engine speed as recited in claim 19.

Ohkawa, simply does not disclose calculating an estimate of an internal EGR quantity. As summarized in Abstract, the control system of Ohkawa continuously varies the valve overlap between the exhaust valve closing timing and the intake valve opening timing by controlling the varying mechanism (VVT), and by so doing, adjusts the amount of the internal EGR in combustion chambers. Ohkawa further discloses an electronic control unit (ECU) 80 that computes a target value θVTA for advancing the valve timing, at step 140 shown in FIG. 6, in accordance with the throttle angle TA and the engine speed NE, to attain the inertia effect of air suction (column 8, lines 45-66). Ohkawa does not disclose calculating an estimate of the amount of the internal EGR in any fashion, much less based on the engine speed, intake valve opening timing, or exhaust valve closing timing.

For at least the reasons above, applicants submit that claim 19 is patentable over Ohkawa. Independent claims 42 and 48 respectively recite “an internal EGR quantity estimating section to calculate an estimated internal EGR quantity of an engine in accordance with an exhaust valve closing timing, an intake valve opening timing and an engine speed of the engine”, and “means for calculating an estimated internal EGR quantity of the engine in accordance with the exhaust valve closing timing, the intake valve opening timing and the engine speed.” Thus independent claims 42 and 48 are patentable over Ohkawa for at least the same reasons as claim 19. The remaining pending claims are dependent from one of independent claims 19, 42 and 48, and are patentable for at least the same reasons as their independent claims, as well as for patentable features recited therein.

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Accordingly, applicants respectfully request that the rejection under 35 U.S.C. 102(b) be withdrawn.

CONCLUSION

In view of the foregoing remarks, applicants respectfully submit that all of the pending claims are now in condition for allowance. An early notice to this effect is earnestly solicited. If there are any questions regarding the application, the Examiner is invited to contact the undersigned at the number below.

Respectfully submitted,

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